

Proposed Acoustics Research Center



Brigham Young University

BYU Acoustics Research Group

Top tier acoustics program based on facilities, curriculum offerings, # of faculty, and quality and # of students

Personnel

- Faculty - 5 full-time faculty (Physics and ME)
 - 1 part-time faculty
 - 1 part-time staff
- Students – 14 Grad, 20+ Undergrad (Physics, ME, EE, other)

Facilities

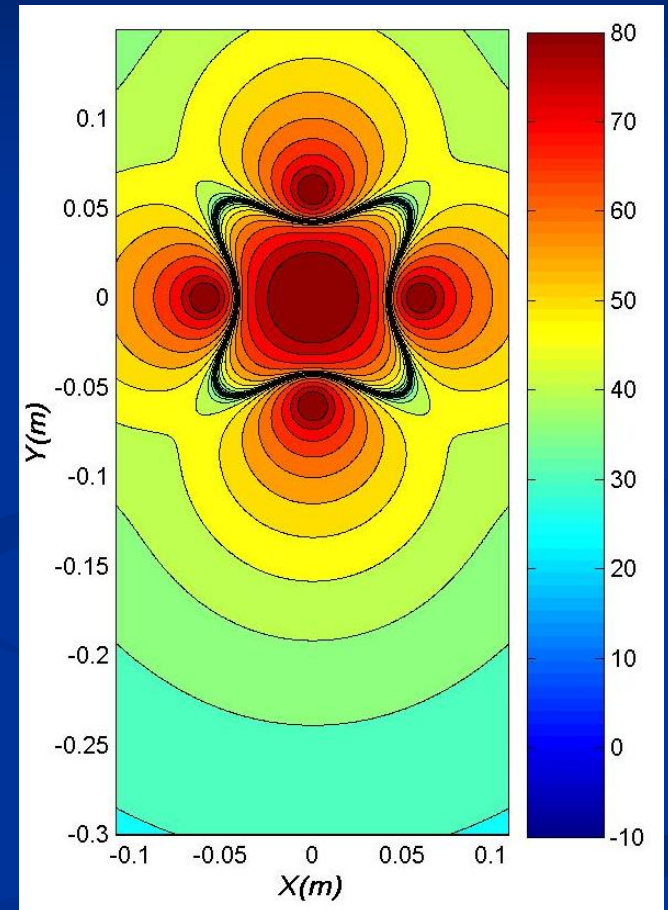
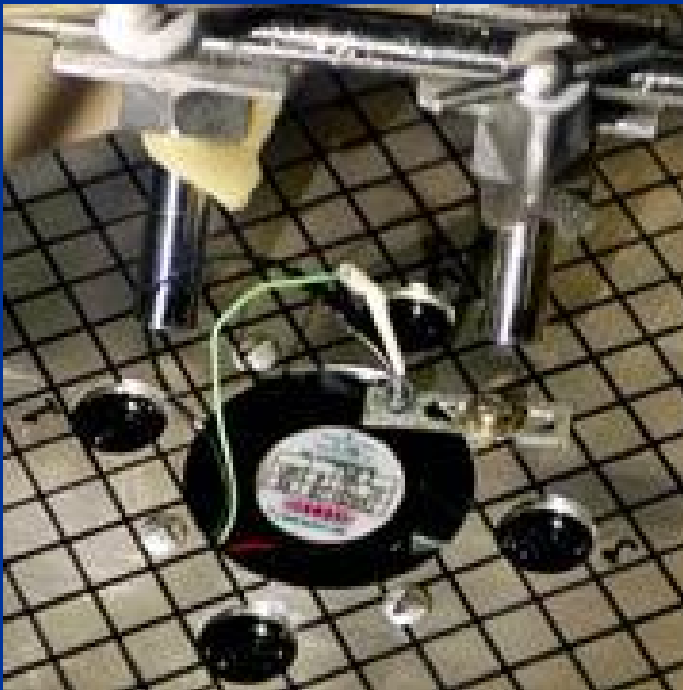
- Side by side reverberation chambers, anechoic chamber, variable acoustics chamber, optics lab, B&K Pulse System, Data Physics System, super computers

Research Focus Areas (04 – present)

- Development of ED sensors
- Energy-based acoustical holography
- SQA of high end sewing machines
- Harsh environment windscreen design
- Numerical modeling of large auditorium
- Structural energy flow
- Energy-based ANC (cabs and fans)
- Active control of fan noise
- Noise-reducing communication devices
- Audio acoustics
- Sound field equalization using ED
- Acoustic array processing

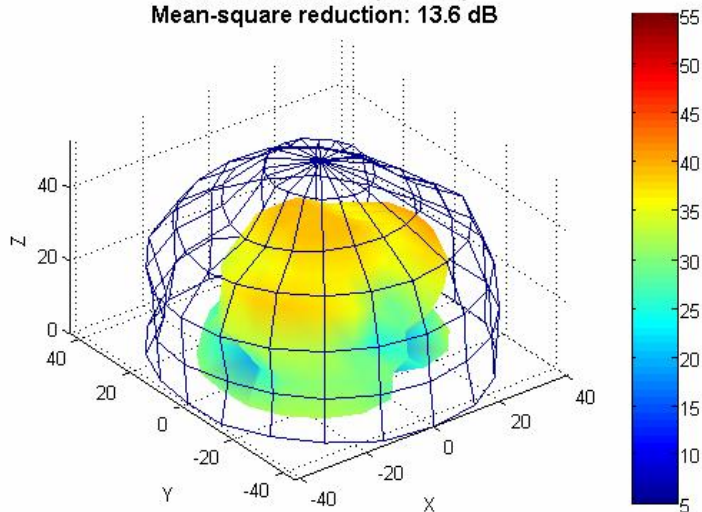
Active Control of Cooling Fans

- Objectives:
 - Multi-channel ANC to achieve global tonal attenuation
 - Error microphones in “practical” near field locations

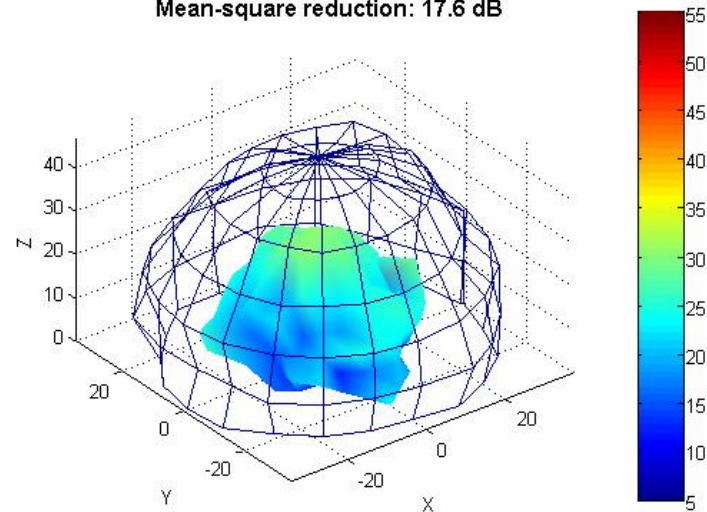


60 mm Fan Results

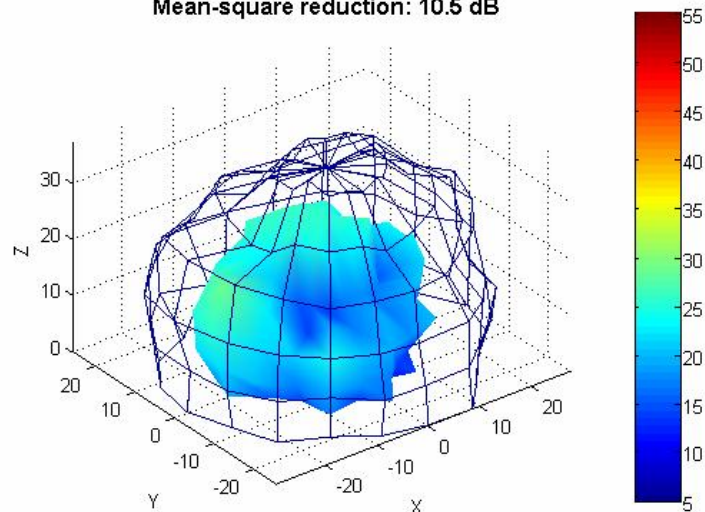
600 Hz - ANC on ($kd = 0.5$)
Mean-square reduction: 13.6 dB



1200 Hz - ANC on ($kd = 1$)
Mean-square reduction: 17.6 dB



1800 Hz - ANC on ($kd = 1.5$)
Mean-square reduction: 10.5 dB



Commercialization Efforts for ANC of Fan Noise

- Currently working with manufacturer of semiconductor testers to determine if system can be successfully used for personal testers in the semiconductor industry
- Working with major PC component supplier on proof-of-concept implementation for processor fans in PCs
- Protected in patent application (#10/407,915 filed April 4, 2003)
- Currently developing feedback control system to target broadband noise from the fan

Market Opportunities

- Potential applications span range from expensive (usually lower volume) to inexpensive (usually higher volume) products
- Cooling fan noise is common complaint in all these market segments
- Technology lends itself to both new and retrofit implementations
- Initial applications could be introduced within one-year time frame

Energy-Based Active Noise Control



- Less dependence on sensor location
- Significantly improved global control
- Fewer sensors compared to squared pressure control

Sound Level Reduction (dBA)

	46 Hz	90 Hz	110 Hz	120 Hz
12-Mic Avg	4.11	0.39	6.12	2.77
Right Ear	3.84	0.60	8.71	4.75
Left Ear	4.27	0.57	8.70	4.69
Sensor	2.6	0.36	7.68	4.48

Commercialization Efforts for Cab ANC

- Have been working for a few years with heavy equipment manufacturer on developing technology
- Company strongly committed to implementing technology in their equipment – targeted for first implementation in 2006
- Protected in patent application (#10/913,312 filed Aug. 9, 2004)
- Company and BYU exploring other applications – trucks, generator enclosures, vibratory compactors

Market Opportunities

- Need for quieter equipment cabs. Company intends to market product as quiet cab. Also needed to meet future noise regulations.
- Applications exist in a number of related markets.
- Strong company commitment for both development and marketing should ensure successful implementation of technology into marketplace.
- Initial applications projected to be introduced within one-year time frame (2007 model).

Filling the Pipeline

- Current active noise control technology being developed for next generation products
- Energy-based acoustics – development of new acoustic sensor and related applications
- Throat microphones for high-noise environments
- Sound quality to improve perceived quality of products

Summary

- ARG is a strong, interdisciplinary research group – no acoustics group like it in intermountain West
- ARG leadership has strength of diverse, yet complementary skills – recognized expertise in active noise control technology
- Current projects span a range from those near commercialization (within 1-2 years), to those targeted to be commercialized within the 3-5 year range
- Strong working relationship between ARG, BYU Tech Transfer, and several companies, which should facilitate transition of technology into marketplace